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Seroprevalence of Peste Des Petits Ruminant's Virus Antibody in Assosa Zone, Benishangulgumuz Region, Ethiopia

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Abstract: *A cross-sectional study design was conducted to determine the seroprevalence and associated risk factors of Peste des Petits Ruminants Virus (PPRV) in four districts of Assosa zone, BenishangulGumuz region, Ethiopia from July to December 2017. A total of 321 serum samples were collected from sheep and goats. ID Screen® PPR competition kit was used for detection of PPRV antibodies by competitive ELISA in the sera of animals. The overall seroprevalence rate was found to be 75.7% (243/321) and species level prevalence rate was found 83.33% (n= 15) in sheep and 75.25% (n= 228) in goats. Among the small ruminants the seroprevalence of PPRV showed statistically significant variations (P=0.0391), being very high in adult and low in young small ruminants. On the contrary there was no significance difference (P>0.05) within districts, species, sex and body conditions. In conclusion PPRV was found to be important small ruminant disease in the study area, thus to control the disease and reduce the economic loss in this area, appropriate control strategies should be given.*

Keywords: *Assosa zone, ELISA, PPRV, Seroprevalence, small ruminant*

Abbreviations: **(***c-ELISA) competitive enzyme linked immunosorbent assay, (ELISA) Enzyme linked immunosorbent assay, (L) Large protein, (Ml) Mille liter, (N) Nucleoprotein, (P) Phosphoprotein, (PPR) Peste des petitis Ruminants, (PPRV) Peste des petitis Ruminants virus*

1. INTRODUCTION

Peste des petits ruminants (PPR) is an infectious and highly contagious disease that affects mainly small ruminants (sheep and goats) and wild ruminants (gazelles and antelopes) [1,2,3].The PPR virus (PPRV) belongs to the genus *Morbillivirus* in the family *Paramyxoviridae*. It is closely related to the rinderpest virus of bovines and buffaloes, distemper virus of dogs and other wild carnivores, human measles virus and *Morbilli viruses* of marine mammals [4, 5]. The disease is characterized by sudden depression, fever, mucopurulent ocular and nasal discharges, necrotizing and erosivestomatitis, severe enteritis, and pneumonia leading to death [6]. In epidemic areas, the morbidity rate is estimated from 80% to 90% and mortality rate ranges from 50% to 80% [7].

The genome of PPRV is single stranded RNA and having approximately 16kb long with negative polarity [8]. PPR virion is enveloped, pleomorphic and composed of 15, 948 nucleotides, the longest of all morbillivirus genomes sequenced so far. This genomic RNA is wrapped by the nucleoprotein (N) to form the nucleocapsid into which are associated two other viral proteins: the phosphoprotein (P) and the large protein (L) [9]. PPR virus can be categorized into four distinct lineages (I, II, III and IV) based on fusion (F) and nucleoprotein (N) gene sequencing. Among the four known lineages of PPR virus, lineage I and II viruses have been found exclusively in West Africa. Lineage III has been found in east Africa, identified in the outbreak of 1996 in Ethiopia, also in the Arabian Peninsula and southern India [10]. In Ethiopia, Clinical PPR was suspected in 1977 in afar region, eastern part of the country [11]. Clinical and serological evidence of its presence confirmed in 1991 in Addis Ababa [12]. PPR is continuously affecting small ruminants and contributing to food insecurity particularly in vulnerable regions of the country.

However accurate data on seroprevalence and information on associated risk factors of PPR infection is scarce in remote areas of the

country. It is helpful to assess the seroprevalence of the disease to recommend possible prevention and control strategies which enhance poverty alleviation program in the country. ID Screen® PPR competition kit was used for detection of PPRV antibody from serum samples. Therefore the objective of the present study was aimed to determine the seroprevalence and identify potential risk factors of Peste des petits ruminant's virus (PPRV) in sheep and goats.

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted from July 2017 to December 2017 in Assosa, Bambasi, Homosha and Sherkole districts of Assosa zone from BenishangulGumuz regional state. In the study areas Small ruminants were reared under extensive management system and specific districts were randomly selected based on population density.

Asosa district is one of district of Asosa Zone situated in BenishangulGumuz Regional State. It is found between 34º 12'32"N and 10º 35'45"E and bordered with Bambasi district in the southern, Oda-buldigilu district in the eastern, Homosha district in the northern, Menge district north eastern, Kurmuk district in the north western, and republic of Sudan in the Western. It is 659 km far from capital city of Ethiopia. The elevation of the district ranges from500-1500 meter above sea level and geographically, it is large made up of plain.

Bambasidistrict is located in BenishangulGumz Regional State of Ethiopia at 614 km far from the capital city, Addis Ababa and it is found between latitude 9^0-10^0 035 N and longitude 034^0-035^0 E. Homosha district is one of the 20 districts in the BenishangulGumuz region of Ethiopia. Part of the Assosa zone, it is bordered by the Assosa on the south, Kurmuk on the northwest andMenge district on the east. Sherkoleis found in Assosa zone of Benishangul Gumuz region, bordered with Menge on the south, Kurmuk district on the west, with Sudan on the north and Kamashi zone on the east.

2.2. Study Animals

A total of 321 small ruminants (sheep and goat) managed extensively were randomly selected and subjected to serological analysis by competitive enzyme linked immunosorbent assay (c-ELISA) kit to determine the seroprevalence of PPRV in the study area. The selected animals were from different districts, species, and age, sex and body condition groups.

2.3. Study Design and Sampling Technique

A cross-sectional study design was conducted in districts of Assosa zone, BenishangulGumuz regional state of Ethiopia from July 2017 to December 2017. The study districts were selected purposely based on their small ruminant population and accessibility. A simple random sampling technique was applied for selection of animals. Finally, animals were selected to test the occurrence of the virus antibody in the selected areas. Districts, species, sex, age and body conditions were concerned as hypothesized risk factors. All sampled sheep and goats were local breed and reared under extensive management system. All necessary information was collected on individual animal bases using a structured questionnaire format.

2.4. Sample Collection

Blood samples (4ml) were collected from Jugular vein using sterile needles and plain vacationer tube labeled with identification number, species, sex, age, body condition and etc. The samples were putted in tilted position at room temperature until the clot was fully separated from the serum. Sera were decanted into cryo-vials, identified and stored at -20°C until screened for antibodies against natural PPR virus infection using serological analysis.

2.5. Laboratory Diagnosis

Serum samples were analyzed by using aID Screen® PPR competition kit according to the instructions of the manufacturer (France) in Assosa Regional Veterinary Diagnostic Laboratory (Assosa, Ethiopia).

2.6. Data Management and Analysis

Data generated from field and laboratory investigations were recorded and coded by using Microsoft Excel spreadsheet and descriptive statistics were applied to calculate the proportion.

The association of potential risk factors such as districts, species, sex, age and body condition with PPRV were assessed using R-Software.

3. RESULTS AND DISCUSSION

ID Screen® PPR competition kit was used to determine seroprevalencerate of PPRV antibody showed that from a total of 321 small ruminants examined for the presence of PPRV antibody,

243small ruminants revealed PPRV antibody in their serum sample with the overall prevalence rate of 75.7%. The odds ratio value of the intercept was 1.583093e-08 which indicates the odds of prevalence of PPR when risk factors held constant. The prevalence rate was higher in Assosadistrict (85.12%) and lower in Bambasi (75%), Sherkole (69.9%) and Homosha (69.09%) districts respectively. Infection rate was statistically nonsignificant (P>0.05) between the study sites. When the district was Bambasi, Homosha and Sherkolethe prevalence of PPRV decreases by 1.1116, 0.1689 and 0.7684log odds respectively here the reference district is Assosadistrict (Table 1).

Table1: *prevalence of PPRV antibody in small ruminants and its association with various risk factors in selected districts of Assosa zone*

	No examined	No of positives	Prevalence %	Coefficients	Odds ratio	P-value
Risk factors				-17.9613	1.583093e-08	
Districts						
Bambasi	20	15	75%	-1.1116	3.290287e-01	0.2993
Homosha	55	38	69.09%	-0.1689	8.446044e-01	0.8515
Sherkole	125	87	69.6%	-0.7684	4.637731e-01	0.2798
Assosa	121	103	85.12%	Reference		
species						
Sheep	18	15	83.33%	-1.2216	2.947700e-01	0.2877
Goat	303	228	75.25%	Reference		
sex						
Male	52	41	78.85%	0.3642	1.439356e+00	0.6994
Female	269	202	75.09%	Reference		
age						
Young	47	28	59.57%	-1.4264	2.401823e-01	**0.0391**
Adult	274	215	78.47%	Reference		
Body Condition						
Medium	49	4	8.16%	16.1028	9.847991e+06	0.9903
Poor	249	239	95.98%	22.0680	3.837157e+09	0.9867
Good	23	0	0%	Reference		

Prevalence of PPRV antibody in sheep and goatswere83.33 % and 75.25% respectively. However, there was no significant difference (P > 0.05) observed between species of the study animals. When the species was sheep the prevalence rate of PPRV is decreases by 1.2216 log odds than goat which was the reference (Table 1).

Prevalence rate of PPRV antibody in male and female small ruminants was 78.85% and 75.09% respectively. But the difference was not statistically significant (p>0.05) with in sex of the study animals. When the sex was male the prevalence rate of PPRV increases by 0.3642log odds than female which were the reference.

Prevalence rate of PPRV antibody was high in adult (78.47%) and low in young (59.57%) small ruminants. Young age category has a coefficient= -1.4264 and p-value = 0.0391 meaning the prevalence of PPR is significantly associated with age hence the p-value is less than 0.05 and here the reference is adult age category which indicates that when the age group is young the prevalence rate of PPRV decreases by1.4264 log odds (Table 1).

Prevalence rate of PPRV antibody washigherin poor body condition (95.98%) than animals with having medium (8.16%) and good body condition (0%) respectively. But there was no significant difference (P > 0.05) observed among body condition of the study animals. When body condition was medium and poor the prevalence of PPRV increases by 16.1028 and 22.068 log odds respectively than good body condition which is a reference (Table 1)

The overall seroprevalence rate of PPRV antibody in small ruminants of the study sites were 75.7%. The present finding was higher than 48.43% in East Shoa and Arsi zone [13], 29.2% in Sitie and Gurage zones [14], 45% in arid zone of Republic of Niger [15], 34.2% in Pakistan [16] and 28.5% in DR. Congo [17] but lower than 80.9% in North and Central Sudan [18]. This variation may be due to the geographical location and climatic differences between the localities, variation in production system and sample size.

The seroprevalence rate of PPRV antibody was higher in Assosa district (85.12%) and lower in

Bambasi (75%), Sherkole (69.9%) and Homosha (69.09%) districts respectively. The infection rate was statistically no significant (P>0.05) between the study sites but the differences might be due to variations in agro climatic conditions and sample size.

The status of PPRV antibody in sheep and goats were 83.33 % and 75.25% respectively. However, there was no significant difference (P > 0.05) recorded. The situation is also observed in studies conducted in Republic of Chad [19] and On the contrary, other studies have revealed the reverse as in Siltie and Gurage zones, Ethiopia, [14]. The difference might be due to the internal factors of the species and probably to the sensitivity of certain animals to the lineages of the virus.

The seroprevalencerate of PPRV antibody between male and female small ruminants was 78.85% and 75.09% respectively but the difference was not statistically significant (p>0.05). Similar result was found by [20] who recorded no statistical significance in prevalence between males and females in Nigeria. This might be due to equal exposure of both male and female small ruminants to the virus because they are herded together and shared communal grazing.

Prevalence rate of PPRV antibody was recorded high in adult (78.47%) and low in young (59.57%) small ruminants. The prevalence of PPRV is significantly associated with age hence the p-value is less than 0.05 and here the reference is adult age category which indicates that when the age group is young the prevalence rate of PPRV decreases by1.4264 log odds. The present findings are in agreement with previous reports by[21] and[22] who found that adult small animals were more sero-positive to PPRV antibody. Age appears to be a factor for sero-positive status and its linear relation suggests that PPRV is highly immunogenic, naturally infected animals remaining positive for a long time [23]. It is because greater probability of older animals to be exposed to PPRV but young, having been in the herds for a shorter period, is less likely to have been in contact with virus.

Prevalence rate of PPRV antibody was higher in a poor body condition (95.98%) than animals with having medium (8.16%) and good body condition (0%) respectively. But there was no Significant difference (P > 0.05) recorded among body conditions of the study animals. This signifies that the importance of PPRV in causing weight loss. Furthermore, PPRV also led to a loss of appetite and poor utilization of food, which results in a loss of body weight.

4. Conclusion

Our study shows that PPR virus has extensively circulated across the study districts. The presence of such a devastating virus poses a serious hindrance to small ruminant productivity. It is currently a major socio-economic animal health problem in the area. Our study provides preliminary information on PPRVsero-prevalence and possible associated risk factors. Therefore, we recommend a more active serological and virological surveillance programs in the study area in addition to implementing intensive vaccination campaigns.

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